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## THE MIDDLE MIOCENE FAUNA FROM THE NACHOLA AND AKA AITEPUTH FORMATIONS, NORTHERN KENYA

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Although the Aka Aiteputh Formation is richly fossiliferous, the diversity of the fauna is remarkably restricted. The bulk of the faunal remains consists of turtle and crocodile scutes of which there are many thousands of specimens, especially at site BG 'U', where there is a vast bone conglomerate comprised almost solely of turtle and crocodile remains, and at site BG 'X' where over 99.9% of the fossils are reptilian.

Molluscs are very rare, fewer than a dozen specimens having been collected from three localities. Fish, birds and snakes are also rare at Nachola. Mammals are more common, but are in any case a minor part of the total fossil assemblage, and many of the mammals are fragmentary and unidentifiable. However, some 83 non-primate mammalian fossils can be identified to at least family level, while about 200 primate specimens are known. In this respect, the Aka Aiteputh Formation is unique. Nowhere else in the world do higher primates comprise more than twice as many fossils as all the other mammals put together. Even at the richest primate sites in Western Kenya, such as Chamtwara (Pickford, 1981) the higher primates comprise only 55% of the non-rodent mammalian fossils.

At least 13 species of fossil mammals are now known from Nachola, all of which are typical of lower Miocene to lower middle Miocene strata of East Africa. An age slightly younger than Rusinga is suggested, perhaps 16-17 Ma being a reasonable estimate of the age on faunal grounds (table. 1).

The depositional facies at Nachola is littoral and fully lacustrine. The richest fossil levels are a shaley sand and silts which underlie it. The shale horizon is undoubtedly a quiet water deposit in which the lamination is still well preserved, despite some trampling by large mammals, presumably some time after consolidation had begun. The lithofacies at Nachola contrasts markedly with the West Kenya sites (Pickford, 1983) which have yielded so many primates.

TABLE I Biostratigraphy of the Nachola Formation

Ma	19	18	17	16	15	14	13	12	11
Paraphiomys piggoti	xxxxxxxxxxxxxxxx								
Prodeinotherium hobleyi	xx								
Archaeobelodon filholi	xxxxxxxxxxxx								
Megalohyrax championi		xxxxxxxxxxxx							
Rhinocerotidae	xx								
Afromeryx zelteni			xxxxxxxxxxxx						
Diamantohyus africanus		xxxxxxxxxxxx							
Kenyasus rusingensis		xxxx							
Libycochoerus sp.			xxxx						
Libycochoerus khinzikebirus				xxxxxx					
Climacoceras gentryi							xxxxxxx		
Dorcatherium piggoti			xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx						
Dorcatherium chappuisi			xxxxxxxxxxxx						
Walangania africanus	xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx								
Victoriapithecus/Prohylobates			xxxxxxx						
Kenyapithecus africanus				xxxxx					
Nyanzapithecus				xxxxxxxxxxxx					
Most likely correlation of Nachola				-----I-----					
Ma	19	18	17	16	15	14	13	12	11

## SYSTEMATIC DESCRIPTIONS

## Mollusca

## Ampullariidae

*Lanistes carinatus* (Olivier)

Material : BG'I' 438'84, BG'I' 421'84. (Figs 1, 2)

Remarks : Two internal moulds of dinistral shells were collected from locality BG 'I'. In places on the periphery of the moulds, the keel structure is preserved, indicating strongly that the species represented is *Lanistes carinatus*. This taxon is today widespread in large freshwater rivers and lakes in tropical and sub-tropical Africa (Verdcourt, 1963).

## Pomatiasidae

*Tropidophora* (*Ligatella*) *miocenica* (Verdcourt). (fig. 3).

Material : BG'L' 440'84, BG'K' 405'84.

Remarks : Two shells of an operculate gastropod from localities BG'K' and BG'L' are typical of the subgenus *Ligatella* which is found in many sites in Western Kenya (Verdcourt, 1963), often in association with hominoids. It has also been recorded at Kirimun (Pickford, 1982) and Kongia. This terrestrial snail is today found principally in dry Country at altitudes lower than 1200 metres in Eastern Africa, but occurs also in coastal forest areas of higher rainfall (1000mm per annum)

Bivalvia  
Mutelidae  
*Etheria elliptica* Lamarck

Material : BG'J' 507'84. (fig. 4).

Remarks : Seven shells from site BG'J' are characteristic of the freshwater oyster *Etheria elliptica* which today inhabits large slowly flowing rivers and clear freshwater lakes.

Pisces

Remarks : A few small fish vertebrae have been collected from site BG'X'.

Reptilia  
Crocodilia  
Crocodilidae  
*Crocodylus cf niloticus*

Material : Many teeth, phalanges, scutes and limb bones.

Remarks : The Nachola and Aka Aiteputh Formations contain many thousands of crocodile bones and teeth at numerous sites. There is nothing in the collection which can provide a secure specific identification, but it seems clear that most if not all the material belongs to *Crocodylus* and not to *Euthecodon*.

Chelonia  
Trionychidae  
*Trionyx sp.*

Material : Many scutes.

Remarks : *Trionyx* scutes are relatively common at most sites in the Nachola and Aka Aiteputh Formations.

Pelomedusidae  
*Pelusios sp.*

Remarks : Pelomedusid scutes are very common in the Nachola Formation, comprising the bulk of chelonian remains in the collections. It is notable that testudinid scutes seem not to be represented

in the available sample.

Squamata

Ophidea

Material ; BG'O' 468'84 (two vertebrae), BG'R' 522'84 (two vertebrae), BG'X' 104' 84 (tooth).

Remarks : Two sets of snake vertebrae and a snake tooth are known from three sites in the Nachola and Aka Aiteputh Formations. From locality BG'O' come two vertebrae large enough to belong to a python. At BG'R', two connected vertebrae represent a smaller snake species or a young python, while from BG'X' there is an isolated snake tooth, probably the poison fang.

Aves

Material : BG'R' 414'84 (wing bone), BG'O' 10'84 (bone), BG'R' 425'84 (phalanx).

Remarks : Three avian bones found at Nachola represent birds about the size of the flamingo, but none of them is well enough preserved to provide a precise identification of the species or genus.

Mammalia

Primates

Cercopithecidae

*Victoriapithecus* or *Prohylobates* sp?

Material : Several cercopithecoid specimens were observed in the field but not collected.

Remarks : The specimens recalled material from Maboko and Buluk. Until the material has been studied carefully, it is not possible to identify the Nachola monkeys to a greater level of precision.

Oreopithecidae

*Nyanzapithecus* sp.

Material : Several upper and lower teeth.

Remarks : Several characteristic upper and lower teeth recall *Nyanzapithecus* from Maboko, Western Kenya (Harrison, 1985). These teeth are described elsewhere (Ishida, this volume).

Proconsulinae

*Proconsul*? sp.

Material : An isolated P<sup>3</sup>.

Remarks : An isolated P<sup>3</sup> with the buccal cusp much higher than the lingual one may represent a

species of *Proconsul* at Nachola. Most of the larger hominoid specimens from this formation, are however, quite distinct from *Proconsul*.

Dryopithecinae  
*Kenyapithecus cf africanus*

Material : More than 170 fossil teeth jaws and some postcranial elements.

Remarks : The Nachola sample tentatively ascribed to *Kenyapithecus africanus* differs in a few characters from material from the type site, Maboko. Since a full description is presented elsewhere the presence of this large bodied hominoid is recorded for the sake of completing the faunal inventory of the formation.

Rodentia  
Thryonomyidae  
*Paraphiomys cf piggoti*

Material : BG'X' 36'84, BG'X' 30'84. (figs 5, 6).

Remarks : Two lower molars, one in a mandible fragment, from site BG'X' represent a species close to *Paraphiomys piggoti*. Both are second lower molars similar in size to specimens from Moruorot, but slightly smaller than specimens from Rusinga. Both teeth possess anteroconids as in the type material from Karungu (Lavocat, 1973). The only significant difference between the Nachola specimens and those from Moruorot and Rusinga is the presence in the Nachola sample of a small tubercle in the buccal valley, a tubercle which is not found in other samples. Apart from this difference the cheek teeth closely resemble samples from Western Kenya.

Rodentia indet.

Material : Four incisors

Remarks : In the Nachola collection there are four incisors belonging to rodents of two different sizes. The larger specimens are flattened on the labial surface and probably belong to *Paraphiomys*. The small specimens remain for the moment unidentified.

Proboscidea  
Deinotheriidae  
*Prodeinotherium* Ehik

Material : Enamel fragment from BG'X'.

Remarks : From site BG'X' comes a fragment of deinotherium enamel. In Western Kenya, deinother-

es are also quite rare, comprising a minor element in the fossil assemblages.

Gomphotheriidae  
*Archaeobelodon cf. filholi* Tassy

Material : BG'K' 513'84 (lower molar fragment, upper tusk fragment, right median cuneiform, proximal end of right McIII, two sesamoids, two central 1st phalanges, one lateral phalanx, one central second phalanx, one magnum fragment, probably of a single individual), BG'K' 517'84 (four upper tusk fragments, lower tusk, three lower molar fragments and a p<sup>4</sup> belonging to a second individual), BG'N' 466'84 (lower molar fragment), BG'K' 514'84 (two upper tusk fragments), and several enamel fragments from localities BG'K', BG'X' and BG'J'.

Remarks : Thick enamelled fragments of proboscidean cheek teeth are relatively common at Nachola, but complete specimens are rare. A few partial molars have been collected from four sites which indicate that a low crowned trilophodont gomphothere is present in the strata. The tusk fragments in the collection are similar to specimens from Kajong, Kenya ; the upper tusks are almost circular in section, while the lower tusks are of a flattened lozenge shape. A few limb bones, including phalanges were also collected, and it is interesting to note that these indicate a much more cursorial locomotor repertoire than the graviportal proboscideans of later times ; indeed the phalanges and metapodials recall to some extent the morphology seen in hippopotami. The material collected so far, although poor, is compatible with the Kajong (Mwiti) sample described by Tassy (1986) as *Archaeobelodon cf. filholi*.

Hyracoidea  
Geniohyidae  
*Megalohyrax championi* Arambourg

Material : BG'X' 245'84 (half a lower cheektooth), BG'S' 538'84 (terminal phalanx), BG'S' 500'84 (complete upper molar), BG'O' 489'84 (lower molar fragment), BG'I'C lower premolar fragment). (fig. 7).

Remarks : Five fragments of a large hyracoid were collected from four sites at Nachola. They are all assigned to *Megalohyrax championi*, the upper molar being indistinguishable from specimens from Moruorot (the type locality), Rusinga (Whitworth, 1954) and Buluk (Harris and Watkins, 1973).

Rhinocerotidae  
Genus and species indet.

Material : BG'O' 503'84 (distal end left radius), BG'M' 505'84 (left talus), BG'K' 515'84 (distal end right tibia) BG'R' 449'84 (proximal end right mt III), BG'R' 454'84 (right cuboid), BG'T' 464'84

(first phalanx III), BG'T' 463'84 (lateral first phalanx)

Remarks : Seven fossil rhinocerotid limb bones from Nachola belong to a species appreciably smaller than *Dicerorhinus leakeyi* and *Aceratherium acutirostratum*. The tibia, cuboid and metatarsal are compatible in size with those of *Paradiceros mukirii*, but are morphologically distinct, being closest in general morphology to those of *A. acutirostratum* (Hooijer, 1966). Until a more diagnostic sample has been made, the affinities of this small rhinocerotid will remain uncertain.

Artiodactyla  
Anthracotheriidae  
*Afromeryx zelteni* pickford

Material : BG'X' 456'84 (complete upper molar), BG'X' 243'84 (lower molar fragment), BG'X' 13'84 (distal end of metapodial), BG'X' 66'84 (lower molar fragment), BG'X' 57'84 (upper molar fragment), BG'O' 3'84 (half a talus), BG'X' 56'84 (upper molar fragment), BG'X' 474'84 (molar fragment), BG'X' 475'84 (right I<sup>2</sup>), BG'X' 57'84 (upper molar fragment), BG'X' 61'84 (molar fragment), BG'X' 345'84 (upper molar fragment), BG'X' 260'84 (lower molar fragment), BG'X' 135'84 (right dI<sup>2</sup>), BG'X' 64'84 (left dI<sup>2</sup>), BG'T' 433'84 (right I<sup>2</sup>), BG'X' 305'84 (right I<sup>2</sup>), BG'X' 304'84 (right I<sup>2</sup>), BG'X' 71'84 (upper molar fragment), BG'J' 534'84 (upper premolar fragment), BG'N' 527'84 (talus), BG'X' 393'84 (upper molar fragment), BG'X' 390'84 (upper premolar), BG'X' talonid of M<sub>3</sub>, BG'X' 287'84 (lower molar fragment), BG'X' 472'84 (molar fragment), BG'X' 473'84 (molar fragment). (figs 10, 11)

Remarks : The small anthracothere from Nachola is closely comparable to the species *Afromeryx zelteni* from Libya. Much of the material is fragmentary, but an upper molar is typical and provides a good identification. Similar anthracotheres have been found at Loperot and Buluk in northern Kenya and at Maboko and Ombo in Western Kenya. This species differs from the similar sized species *Sivameryx africanus* from Karungu and Rusinga, by being tetracuspidate in the upper molars instead of pentacuspidate. The lower molars are less selenodont than those of *Sivameryx africanus*.

Sanitheriidae  
*Diamantohyus africanus* Stromer

Material : BG'X' 182'84 (right M<sup>3</sup>), BG'O' 528'84 (talus). (fig. 12).

Remarks : A partial upper third molar and a talus are identified as *Diamantohyus africanus* (Stromer, 1926). The molar is characteristic with a narrow labial cusp and much wider lingual cusp which has an anterior arm or crest which wraps round the front end of the labial cusp. The enamel is heavily wrinkled as in specimens from Karungu and Maboko, Western Kenya. The talus is comparable to specimens from Karungu and Gumba, Rusinga.



## Suidae

*Libycochoerus* sp.

Material : BG'K' 432' 84 (left M<sub>3</sub> in mandible fragment), BG'K' 435'84 (left M<sup>2-3</sup>) in maxilla fragment), BG'X' 201'84 (M<sup>3</sup> fragment), BG'X' 183'84 (left P<sup>4</sup>), BG'O' 529'84 (distal end of metapodial) BG'T' 433'84 (right I<sub>2</sub>). (figs 8, 9)

Remarks : Five dental specimens and a metapodial are referred to a species of *Libycochoerus* slightly smaller than *L. jeanelli*) from Moruorot and Rusinga. Two upper molars in a maxilla fragment possess labial cingula which are characteristic of the Kubanochoerinae. The P<sup>4</sup> has two buccal cusps closely compressed against each other, and the third lower molar is almost bilaterally symmetrical longitudinally. Finally, the lower second incisor is similar to that of *L. jeanelli* but are larger than those of *Kenyasus rusingensis*. The Nachola specimens probably represent a new species, but better remains are required before taking the step of naming one formally.

*Kenyasus rusingensis* Pickford

Material : Molar

Remarks : A molar which closely recalls *Kenyasus rusingensis* was collected from Nachola.

*Libycochoerus khinzikebirus* (Wilkinson)

Material : P<sup>4</sup>.

Remarks : An upper fourth premolar of a gigantic suid was observed in the field but left in place for future collection. This tooth probably represents *Libycochoerus khinzikebirus*, a suid known from Maboko, Western Kenya, and Gebel Zelten, Libya.

## Ruminantia

## Climacoceratidae

*Climacoceras gentryi* Hamilton

Material : GB'S' (ossicone fragments and frontal), BG'S' 535'84 (half a talus), BG'N' 467'84 (talus), BG'O' 9'84 (phalanx), BG'R' 423'84 (lower molar fragment), BG'X' 342'84 (upper molar fragment), BG'R' 524'84 (lower molar fragment).

Remarks : A few rather scrappy tooth fragments, footbones and ossicones are identified as belonging to *Climacoceras gentryi* (Hamilton, 1978), which has hitherto been described from Fort Ternan and Ngorora. The ossicone is of the *C. gentryi* type rather than the *C. africanus* type. The dental specimens recall material from Maboko Island, but are not by themselves diagnostic, nor are the tali and phalanx, which are merely referred to this ruminant species.

## Tragulidae

*Dorcatherium cf piggoti* Whitworth

Material : BG'R' 524'84 (left  $M_1$ ), BG'O' 530'84 (patella), BG'R' 450'84 (right mandible fragment with  $P_3$ ), BG'X' 115'84 (right  $M^1$ ), BG'O' 14'84 (distal end of metapodial), BG'O' 13'84 (phalanx), BG'X' 395'84 (broken talus), BG'X' 146'84 (rear two lobes of  $M_3$ ). (figs 13, 14).

Remarks : Eight fossils are identifiable as representing a medium sized tragulid, possibly *Dorcatherium piggoti* (Whitworth, 1958). The teeth in particular, seem to be close in size and morphology to specimens from Rusinga, Kenya.

*Dorcatherium chappuisi* Arambourg

Material : BG'R' 424'84 (distal end of metapodial), BG'X' 83'84 (worn right  $M_3$ ), BG'X' 30'84 (rear two lobes of right  $dM_3$ ), BG'X' 38'84 (anterior half of right  $M_1$ ), BG'X' 283'84 (right  $dM^4$ ). (fig. 15).

Remarks : Five specimens of tragulid from Nachola are large enough to represent the species *D. chappuisi*, which was first described from Moruorot (Arambourg, 1933), and was later found in abundance at Rusinga and Maboko (Whitworth, 1958). The  $dM^4$ ,  $dM_3$  and the  $M_1$  in particular, are close in size and shape to specimens from Rusinga and Moruorot.

## Moschidae?

*Walangania africanus* (Whitworth)

Material : BG'X' 322'84 (rear half of left  $M_2$ ), BG'X' 109'84 (rear half of left  $M_2$ ), BG'X' 28'84 (left  $M_2$ ). (fig. 16).

Remarks : Three lower teeth from Nachola are closely similar to specimens from Koru, Songhor, Rusinga and Moruorot identified as *Walangania africanus*. The lingual cusps of the lower molars are characteristically angular, the buccal cusps possess small fan-shaped styles and the enamel is finely wrinkled in the giraffid style.

## Biostratigraphy.

On the basis of the Nachola fauna the formation is clearly either very late in the lower Miocene or early in the middle Miocene, perhaps about  $16 \pm 1$  Ma (table 1). Most of the taxa from this formation are commonly found in Faunal Sets II and III of Pickford (1981), but a few taxa, including the primates (*Kenyapithecus*, oreopithecids, victoriapithecids), the suids (*Libycochoerus khinzi-kebirus* and *Libycochoerus* sp.), *Climacoceras gentryi* and *Afromeryx zelteni* indicate an age younger than Rusinga (Set II) where these taxa have not been reliably recorded. There seems little doubt that Nachola is substantially younger than faunas from Songhor and Koru (set I). On the

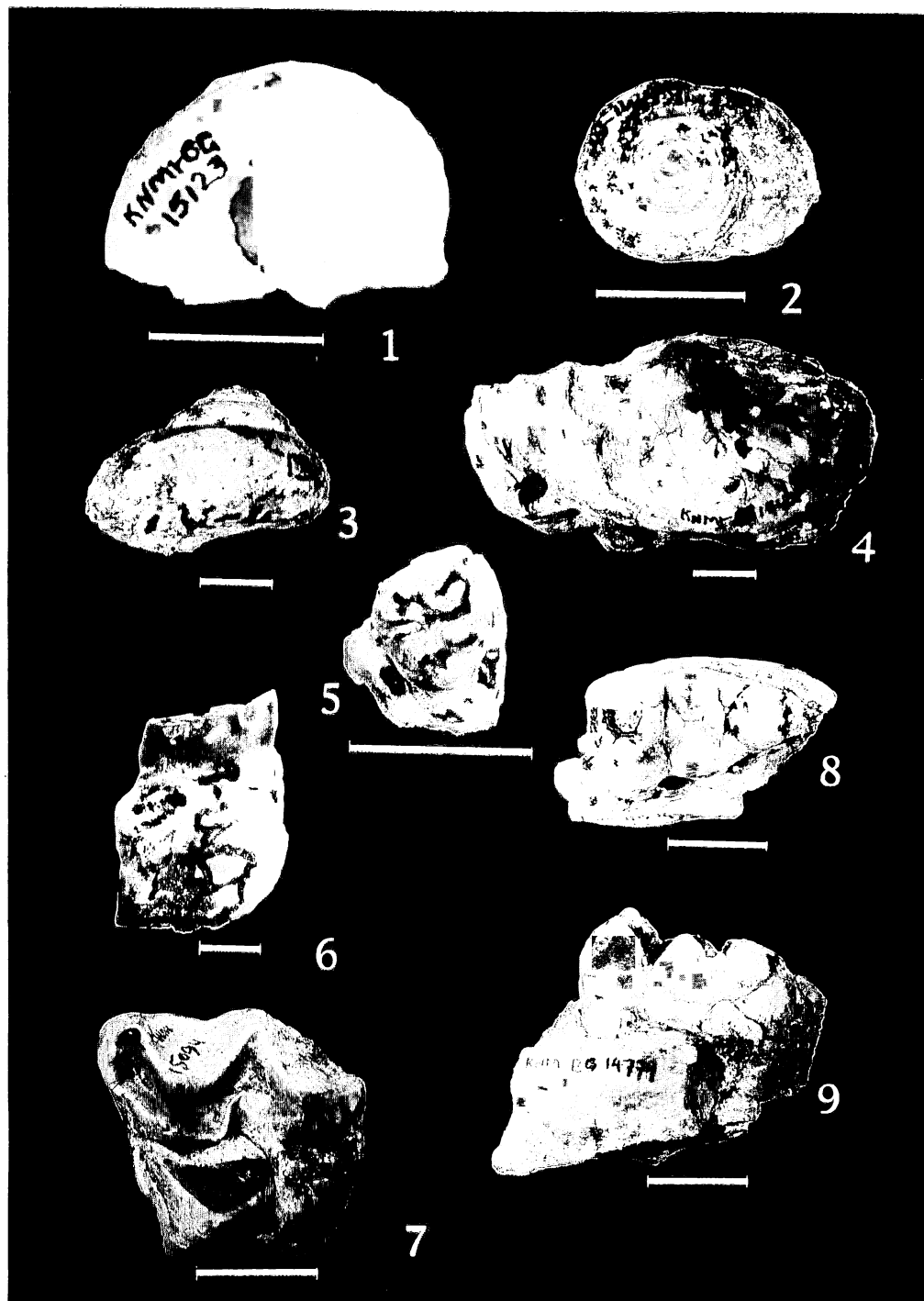
other hand, it seems that Nachola is likely to be older than Fort Ternan and Ngorora, despite the presence of *Climacoceras gentryi*. Indeed the latter species might indicate that there are some patches of younger strata in the Nachola area. The bulk of the fauna has a clear stamp of Set III, probably Set IIIb rather than IIIa. Whatever the case, Nachola is not very far removed in time from Maboko, Moruorot and Loperot, and possibly Gebel Zelten, Libya.

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- Fig. 1** BG'T' 421'84 (KNM BG 15123). *Lanistes carinatus*.  
**Fig. 2** BG'T' 438'84 (KNM BG 15125). *Tropidophora miocemica*.  
**Fig. 3** BG'K' 405'84 (KNM BG 15124). *Tropidophora miocenica*.  
**Fig. 4** BG'J' 507'84 (KNM BG 15122). *Etheria elliptica*.  
**Fig. 5** BG'X' 36'84 (KNM BG 15096) *Paraphiomys* cf *piggoti*, occlusal view of right M<sub>2</sub>.  
**Fig. 6** BG'X' 36'84 (KNM BG 15096) *Paraphiomys* cf *piggoti*, labial view of right M<sub>2</sub>.  
**Fig. 7** BG'S' 500'84 (KNM BG 15094) *Megalohyrax championi*, occlusal view of upper molar.  
**Fig. 8** BG'K' 432'84 (KNM BG 14779) *Libycochoerus* sp. occlusal view of left M<sub>3</sub>.  
**Fig. 9** BG'K' 432'84 (KNM BG 14779) *Libycochoerus* sp. labial view of left M<sub>3</sub>.



- Fig. 10** BG'X' 475'84 (KNM BG 15097) *Afromeryx zelteni*, right I<sup>2</sup> lingual view.
- Fig. 11** BG'X' 456'84 (KNM BG 14802) *Afremeryx zelteni*, upper molar, occlusal view.
- Fig. 12** BG'X' 182'84 (KNM BG 16905) *Diamantohyus africanus*, right M<sup>3</sup>, occlusal view.
- Fig. 13** BG'X' 115'84 (KNM BG 16909) *Dorcatherium* cf *piggoti*, occlusal view of right M<sup>1</sup>.
- Fig. 14** BG'R' 450'84 (KNM BG 16911) *Dorcatherium* cf *piggoti*, right mandible fragment with P<sub>3</sub>, buccal view.
- Fig. 15** BG'X' 83'84 (KNM BG 14775) *Dorcatherium chappuisi*, right M<sub>3</sub> occlusal view.
- Fig. 16** BG'X' 28'84 (KNM BG 15894) *Walangania africanus*, left M<sub>2</sub>, occlusal view.

